

299-W15-210 (A7508) Log Data Report

Borehole Information:

Borehole: 299-W15-210 (A7508)		Site: 216-T-23 Trench			
Coordinates (WA State Plane)		GWL (ft)¹: Not deep enough		GWL Date: 12/17/2002	
North	East	Drill Date	TOC² Elevation	Total Depth (ft)	Type
136,179.25 m	566,548.74 m	Oct. 1982	207.173 m	101	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	2.75	8 5/8	8	5/16	+2.75	101
The logging engineer measured the casing stick up using a steel tape. A caliper was used to determine the outside casing diameter. The caliper and inside casing diameter were measured using a steel tape. Measurements were rounded to the nearest 1/16 in. Casing thickness was calculated.						

Borehole Notes:

Borehole coordinates, elevation, and well construction information are from measurements by Stoller field personnel, HWIS³, and Chamness and Merz (1993). The logging engineer measured the depth-to-bottom reported above. Zero reference is the top of the 8-in. casing. Top of casing is cut evenly. A reference point survey "X" is located on top of the casing stickup. According to Chamness and Merz (1993), the borehole was grouted, but the depth interval was not specified.

Logging Equipment Information:

Logging System:	Gamma 2A	Type:	SGLS (35%)
Calibration Date:	10/2002	Calibration Reference:	GJO-2002-383-TAC
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Logging System:	Gamma 1C	Type:	HRLS
Calibration Date:	02/07/02	Calibration Reference:	GJO-2002-309-TAR
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3/Repeat		
Date	12/19/02	12/23/02	12/23/02		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	72.0	100.0	29.0		
Finish Depth (ft)	3.0	71.0	19.0		
Count Time (sec)	100	100	100		
Live/Real	R	R	R		

Log Run	1	2	3/Repeat		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	1.0	1.0	1.0		
ft/min	N/A ⁴	N/A	N/A		
Pre-Verification	BA179CAB	BA181CAB	BA181CAB		
Start File	BA180000	BA181000	BA181030		
Finish File	BA180069	BA181029	BA181040		
Post-Verification	BA180CAA	BA181CAA	BA181CAA		
Depth Return Error (in.)	0	N/A	0		
Comments	Fine-gain adjustment after file BA180007.	No fine-gain adjustment.	No fine-gain adjustment.		

High Rate Logging System (HRLS) Log Run Information:

Log Run	1	2	3/Repeat		
Date	01/06/03	01/06/03	01/07/03		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	74.0	38.0	36.0		
Finish Depth (ft)	50.0	29.0	31.0		
Count Time (sec)	200	200	200		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	1.0	1.0	1.0		
ft/min	N/A	N/A	N/A		
Pre-Verification	AC049CAB	AC049CAB	AC050CAB		
Start File	AC049000	AC049025	AC050000		
Finish File	AC049024	AC049034	AC050005		
Post-Verification	AC049CAA	AC049CAA	AC0053CAA		
Depth Return Error (in.)	N/A	-1	0		
Comments	No fine-gain adjustment.	Fine-gain adjustment after file AC049024.	Repeat section. No fine-gain adjustment.		

Logging Operation Notes:

Zero reference is the top of casing for both the SGLS and HRLS. Logging was performed with a centralizer installed on the both the SGLS and HRLS sondes. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (⁴⁰K, ²³⁸U, and ²³²Th) verifier with SN 082, and pre- and post-survey verification measurements were acquired for the HRLS in the Cs-137 verifier SN 1013. During SGLS logging, one fine-gain adjustment was needed to maintain the 1460-keV (⁴⁰K) photopeak at a pre-described channel.

Analysis Notes:

Analyst:	Sobczyk	Date:	01/10/03	Reference:	GJO-HGLP 1.6.3, Rev. 0
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SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day. The verification spectra were all within the control limits. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were between 1 and 5 percent of each other.

HRLS pre-run and post-run verification spectra were collected at the beginning and end of each day. The spectra were within the acceptance criteria for the field verification of the Gamma 1C logging system (HRLS).

Log spectra for both the SGLS and HRLS were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G2AOct02.xls), using parameters determined from analysis of recent calibration data. Zero reference was the top of the 8-in. casing. The casing configuration was assumed to be one string of 8-in. casing to total depth (100 ft). The casing correction factor was calculated assuming a casing thickness of 5/16 (0.313) in. This casing thickness is based upon the field measurement. A water correction was not needed or applied to the SGLS data.

Using the SGLS, dead time greater than 40 percent was encountered in the intervals from 31 to 37 ft, 52 to 57 ft, and 61 to 72 ft. Data from this region were considered unreliable. At SGLS dead time greater than 40 percent, peak spreading and pulse pile-up effects may result in underestimation of activities. This effect is not entirely corrected by the dead time correction, and the extent of error increases with increasing dead time. SGLS dead time corrections were applied when dead time reached 10.5 percent. The HRLS was utilized to obtain data where the SGLS dead time exceeded 40 percent.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. In addition, a comparison log plot of man-made radionuclides is provided to compare the data collected by Westinghouse Hanford Company's Radionuclide Logging System (RLS) with SGLS data. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs was the only man-made radionuclide detected in this borehole. ^{137}Cs was detected near the ground surface (5 to 10 ft) with a maximum concentration of 0.4 pCi/g. The interval between 20 and total depth (100-ft log depth) contained the highest concentrations of ^{137}Cs . The highest concentration detected was 42,300 pCi/g at 32 ft.

Due to the method of well completion, SGLS results in this borehole may not reflect the distribution of the natural or man-made radionuclides in the formation. The grouted interval is not known. The presence of an annulus filled with grout around the casing greatly attenuates gamma rays originating in the surrounding

formation. The depth interval results from this borehole may not reflect actual concentrations in the formation and should be used with caution.

The plots of the repeat logs demonstrate good repeatability of the SGLS data for both the man-made and natural radionuclides at the following energy levels: 661, 609, 1461, 1764, and 2614 keV.

Comparison log plots of data collected in 1992 by Westinghouse Hanford Company and in 2003 by Stoller are included. The 1992 concentration data for ^{137}Cs are decayed to the date of the HRLS logging event in January 2003 and shifted from a ground level reference to a TOC reference. On the 2003 logs, the apparent ^{137}Cs concentrations between 75 and 78 ft are slightly higher than that predicted by decay alone when compared to the 1992 log. The apparent ^{137}Cs concentrations on the 2003 log between 82 and 94 ft appear to be slightly lower than that predicted by decay alone when compared to the 1992 log.

Because of this borehole's close proximity to the 216-T-24 Trench, it is recommended that this borehole be logged periodically to verify that the changes observed in contaminant profile over the last 10 years have occurred. The interval from 30 ft to total depth should be logged again in 5 years.

References:

Chamness, M.A. and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, Pacific Northwest Laboratory, Richland, Washington.

¹ GWL – groundwater depth

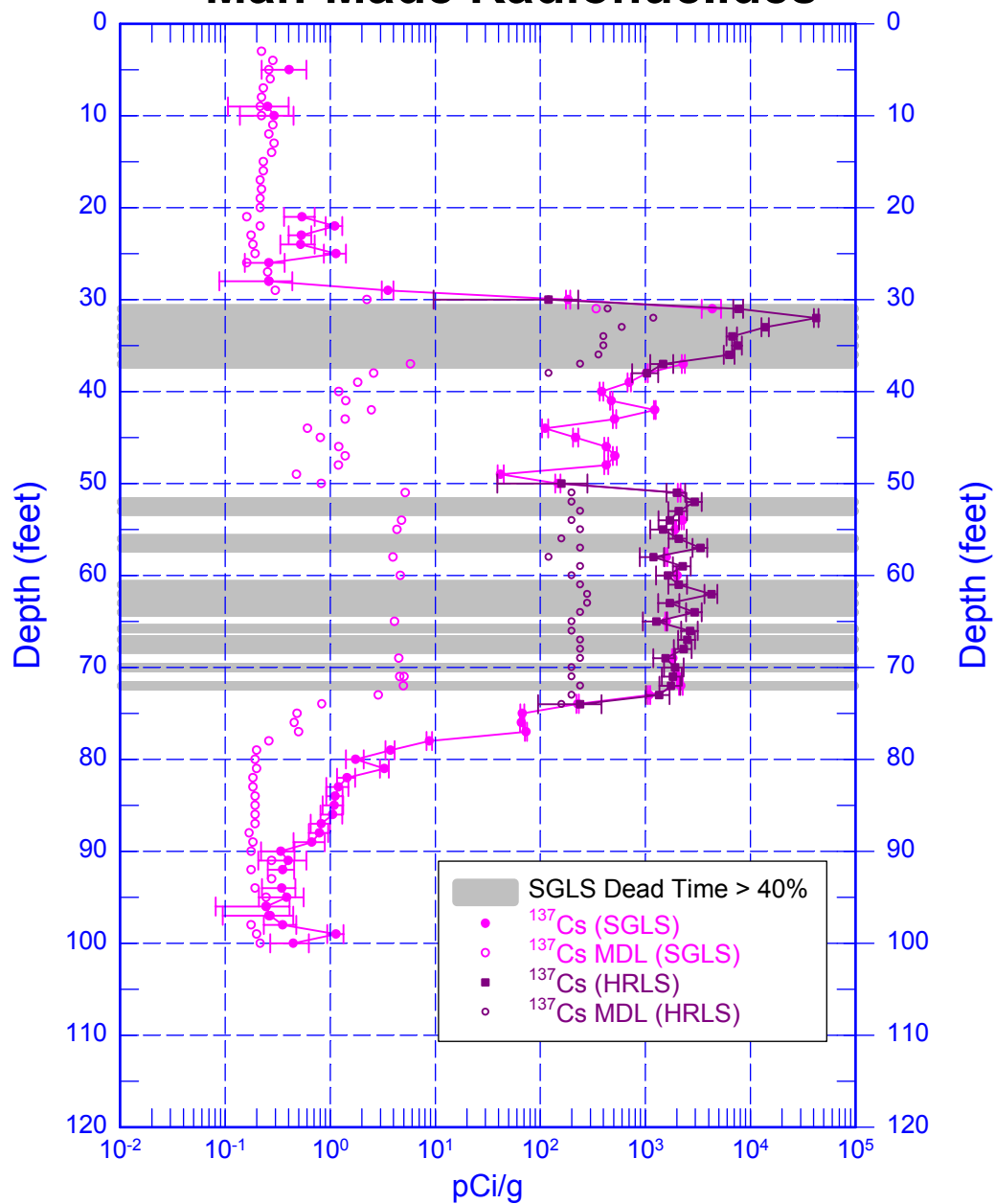
² TOC – top of casing

³ HWIS – Hanford Well Information System

⁴ n/a – not applicable

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Man-Made Radionuclides

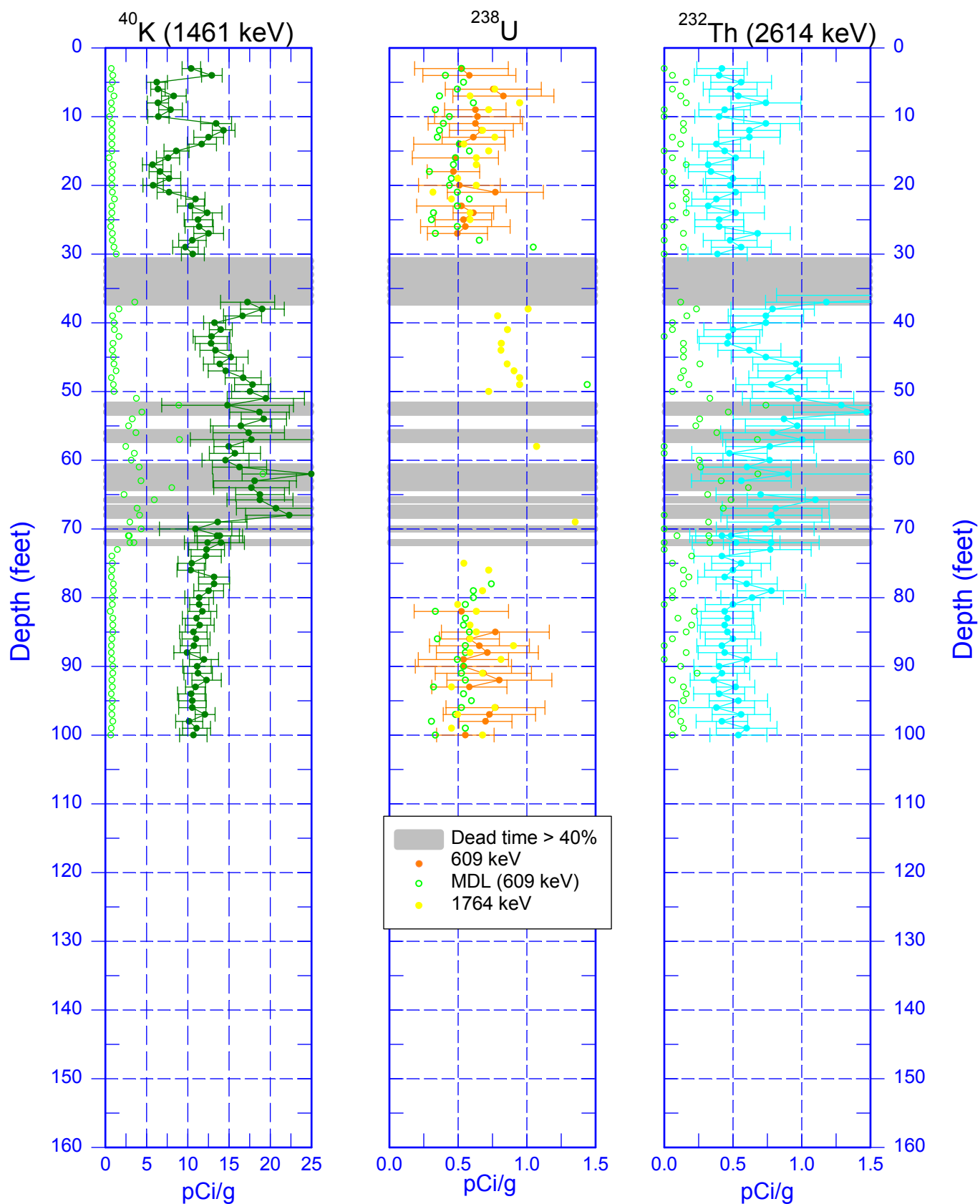


Zero Reference = Top of Casing

Date of Last Logging Run
1/06/2003

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Natural Gamma Logs

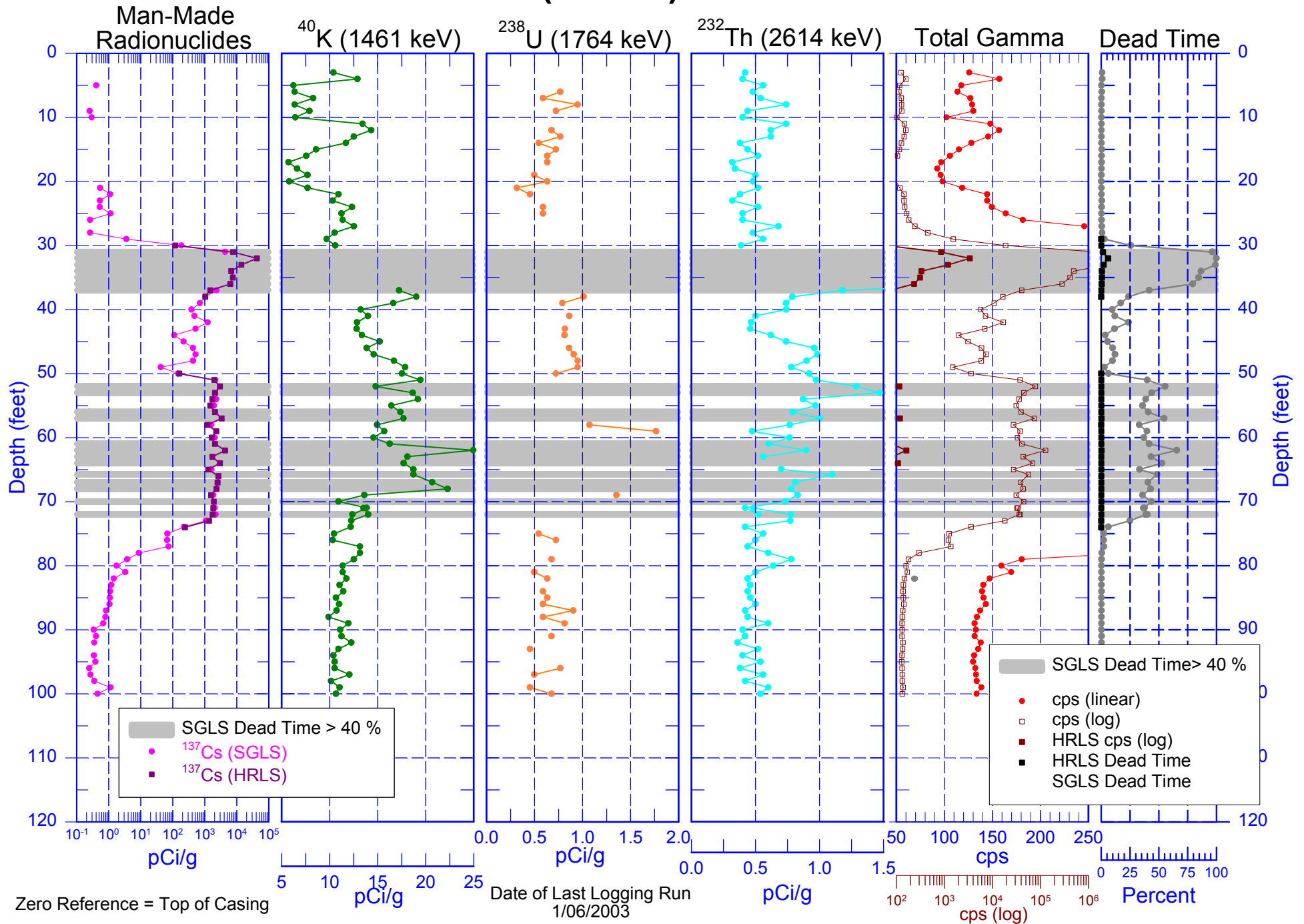


○ MDL

Zero Reference = Top of Casing

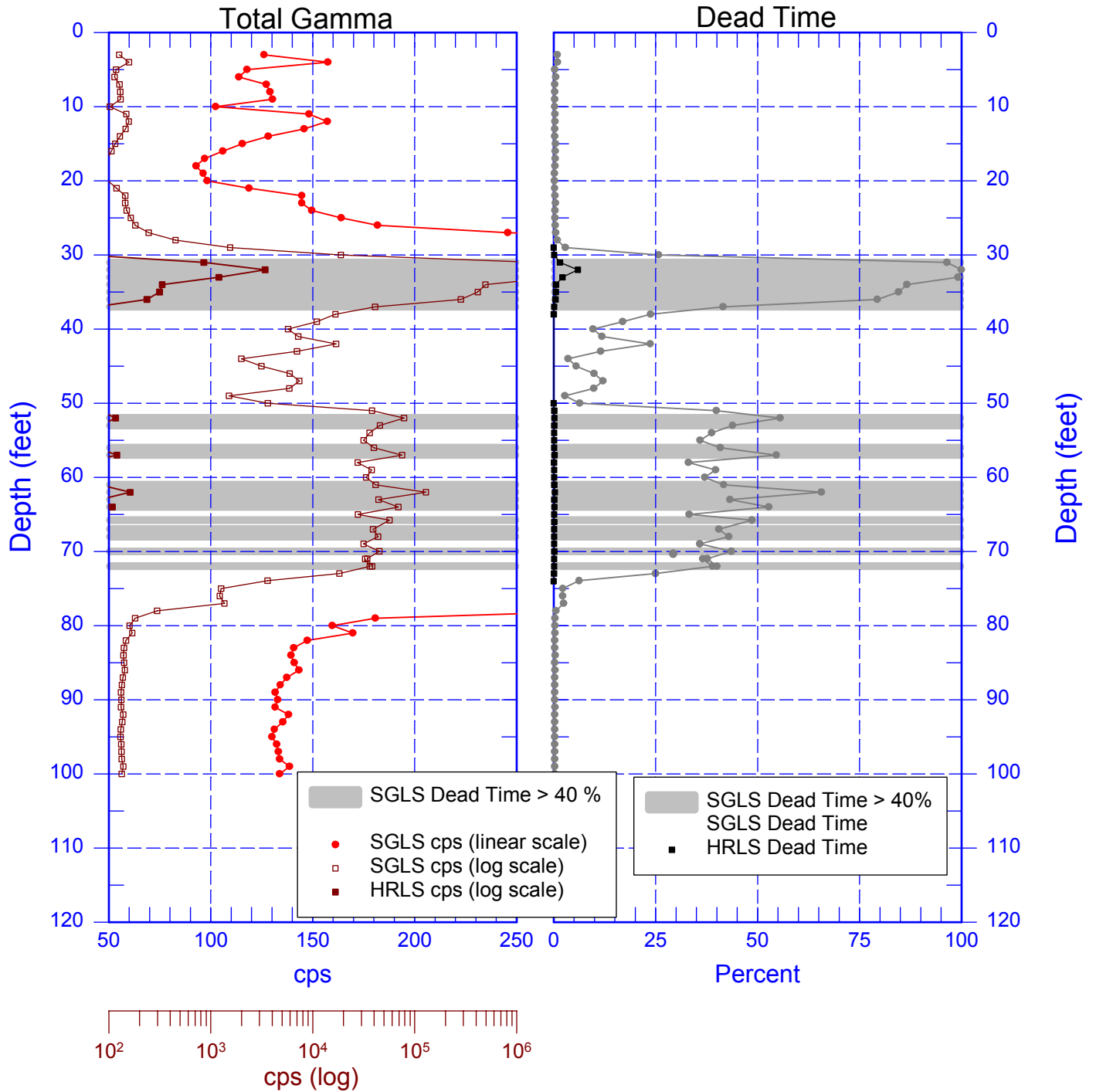
Date of Last Logging Run
12/23/2002

299-W15-210 (A7508) Combination Plot



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Total Gamma & Dead Time

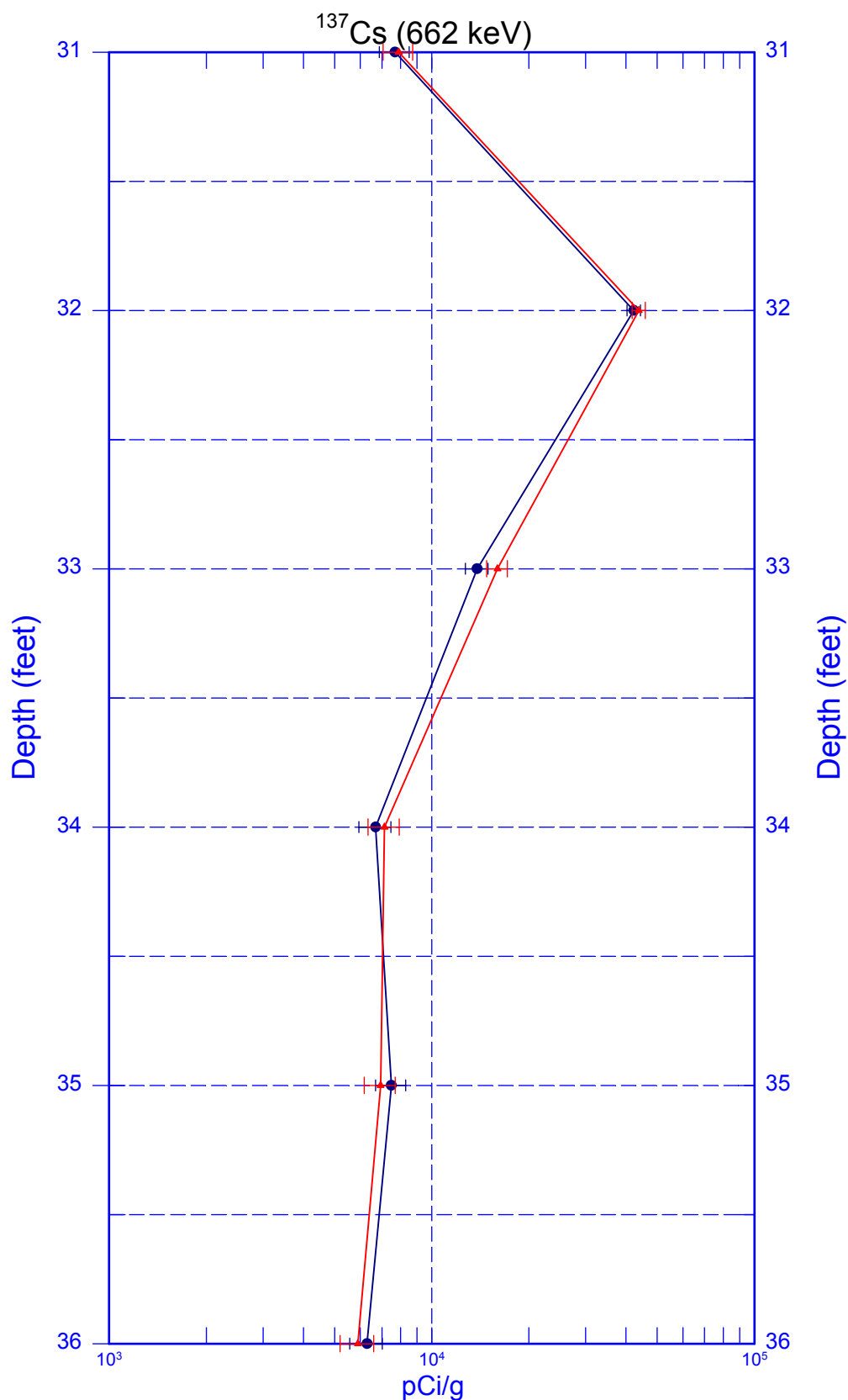


Zero Reference = Top of Casing

Date of Last Logging Run
1/06/2003

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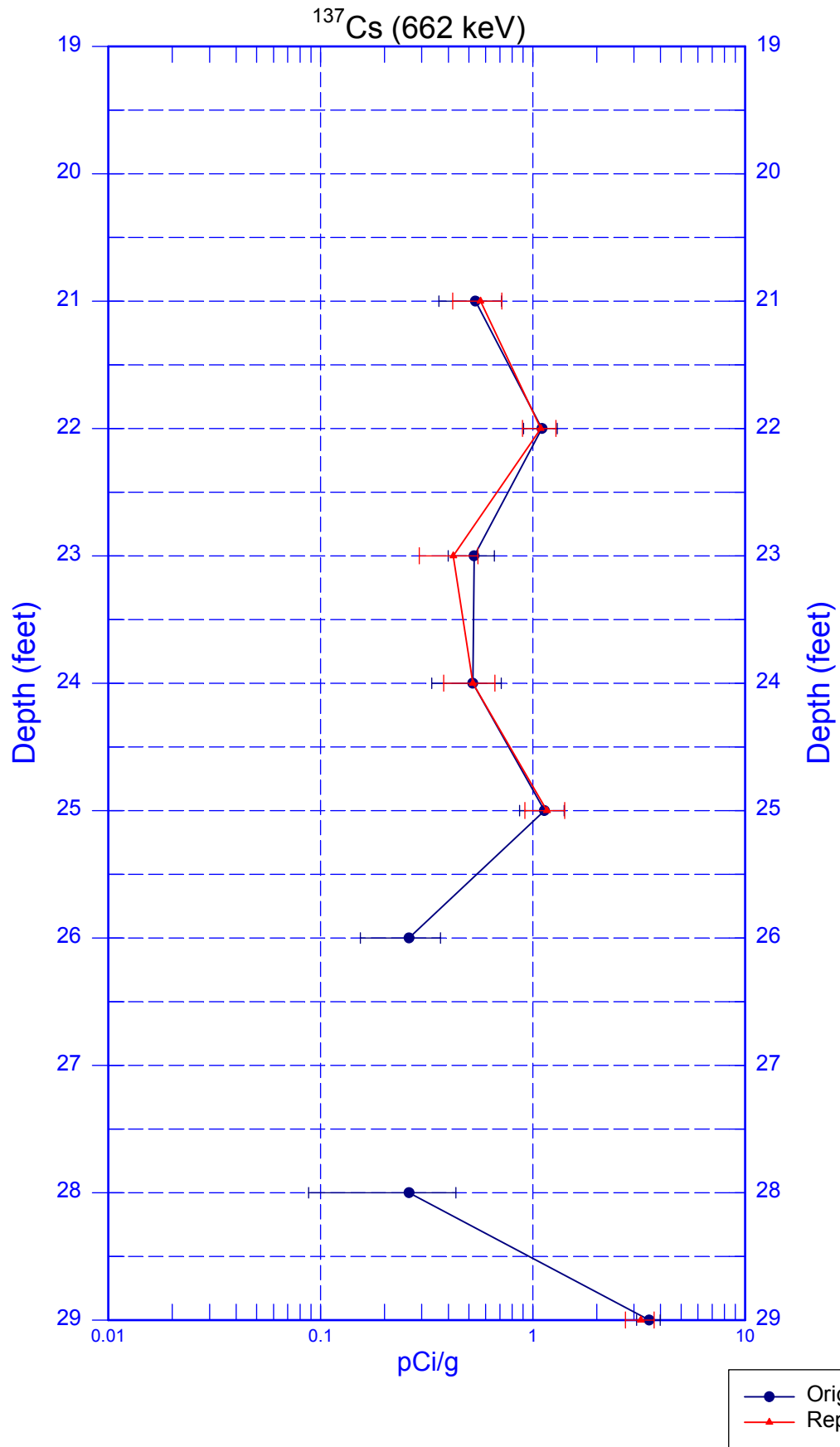
Rerun of Man-Made Radionuclides (36.0 to 31.0 ft)



—●— Original Log Run
—▲— Repeat Log Run

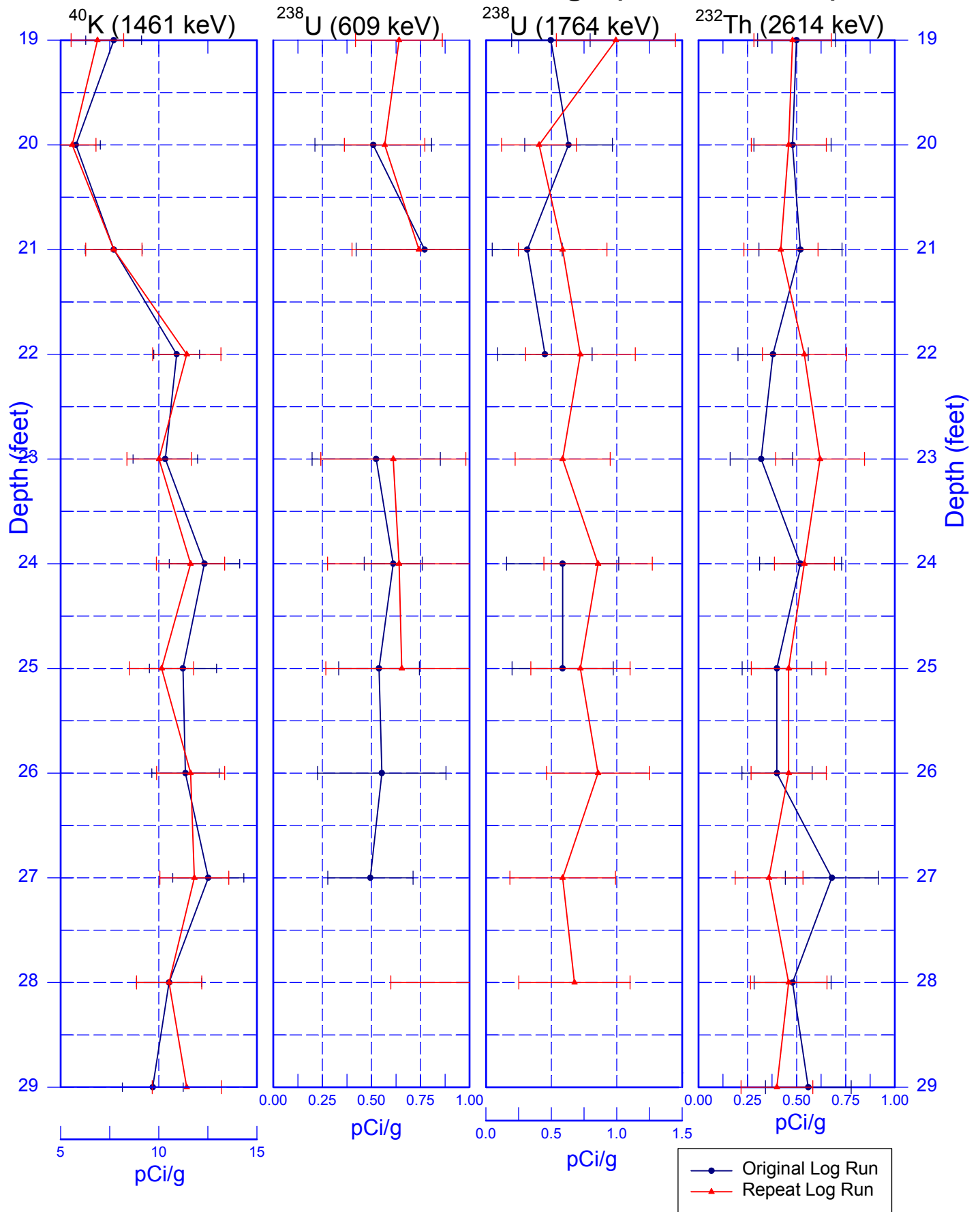
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Rerun of Man-Made Radionuclides (29.0 to 19.0 ft)



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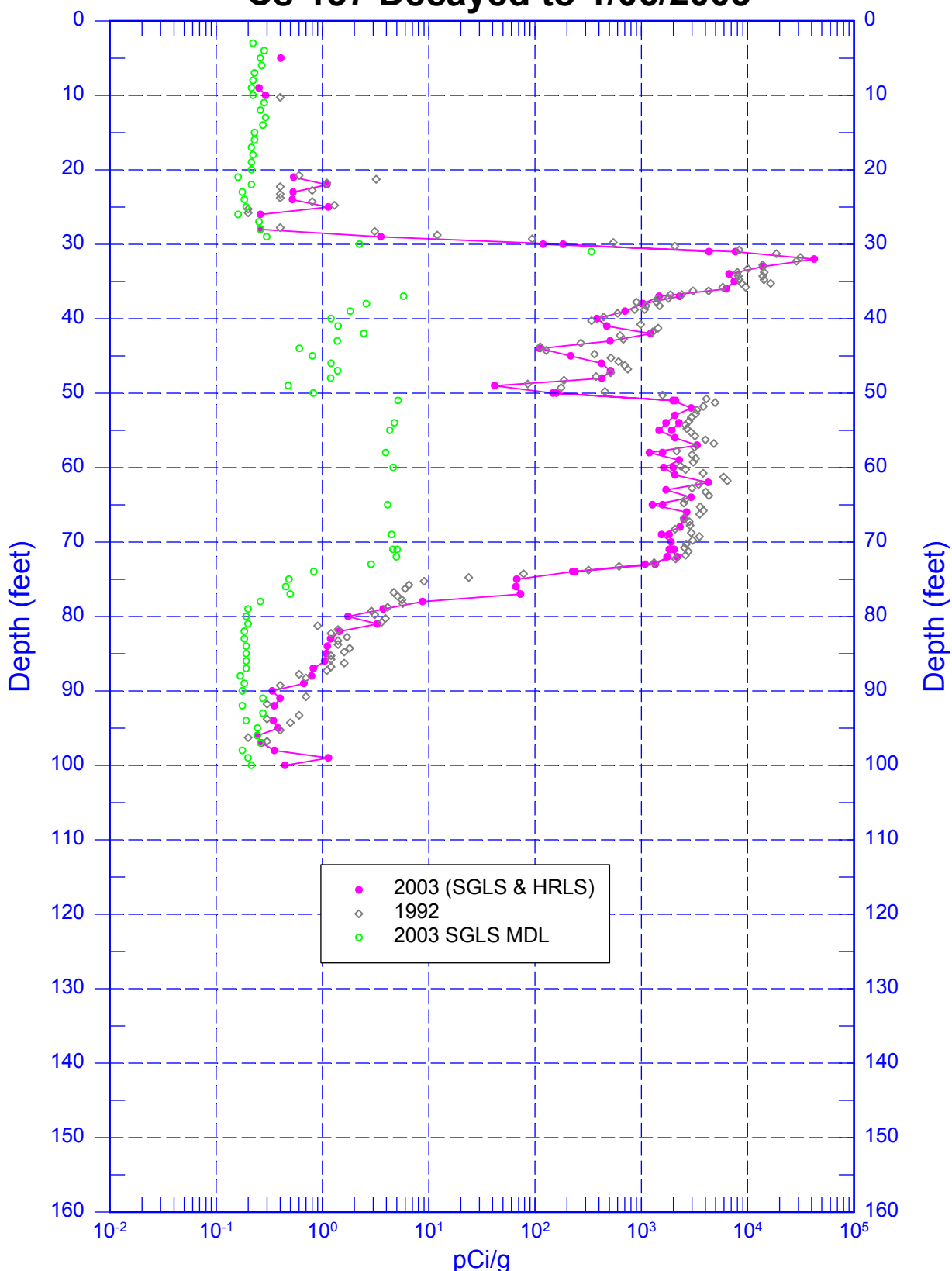
Rerun of Natural Gamma Logs (29.0 to 19.0 ft)



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RLS Data Compared to SGLS & HRLS Data

Cs-137 Decayed to 1/06/2003



Zero Reference = Top of Casing (2002 SGLS & HRLS)
 1992 RLS data shifted +2.75 ft to align with 2003 SGLS & HRLS
 RLS data ends at 97.3 ft